Disclosure to Promote the Right To Information

Whereas the Parliament of India has set out to provide a practical regime of right to information for citizens to secure access to information under the control of public authorities, in order to promote transparency and accountability in the working of every public authority, and whereas the attached publication of the Bureau of Indian Standards is of particular interest to the public, particularly disadvantaged communities and those engaged in the pursuit of education and knowledge, the attached public safety standard is made available to promote the timely dissemination of this information in an accurate manner to the public.

"जानने का अधिकार, जीने का अधिकार"
Mazdoor Kisan Shakti Sangathan
"The Right to Information, The Right to Live"

"पुराने को छोड़ नये के तरफ"
Jawaharlal Nehru
"Step Out From the Old to the New"

IS 6776 (1980): Knurling Wheels [PGD 32: Cutting tools]

"ज्ञान से एक नये भारत का निर्माण"
Satyanarayan Gangaram Pitroda
"Invent a New India Using Knowledge"

"ज्ञान एक ऐसा खजाना है जो कभी चुराया नहीं जा सकता है"
Bhartṛhari—Nītiśatakam
"Knowledge is such a treasure which cannot be stolen"

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Indian Standard

SPECIFICATION FOR KNURLING WHEELS

(First Revision)

1. Scope — Covers the dimensions and requirements of knurling wheels with milled profile and ground profile, suitable for producing knurlings, according to the dimensions of knurling given in Appendix A.
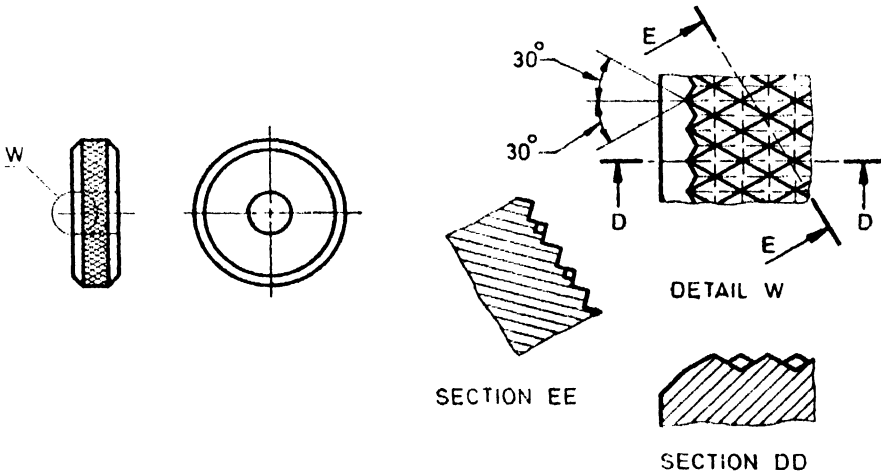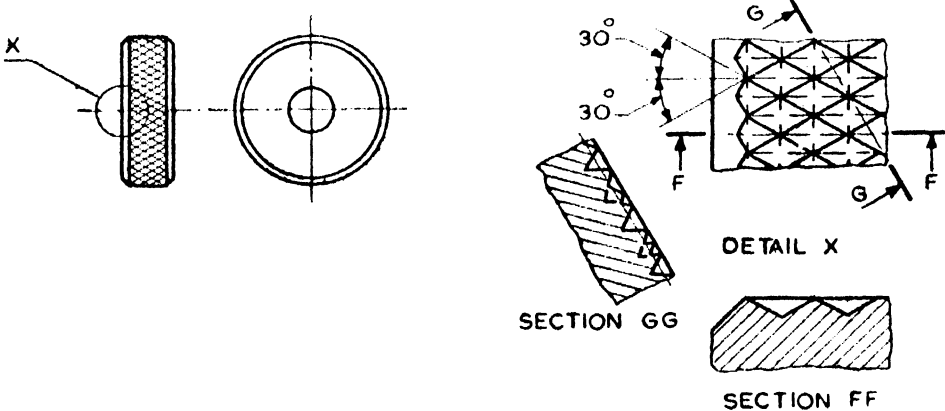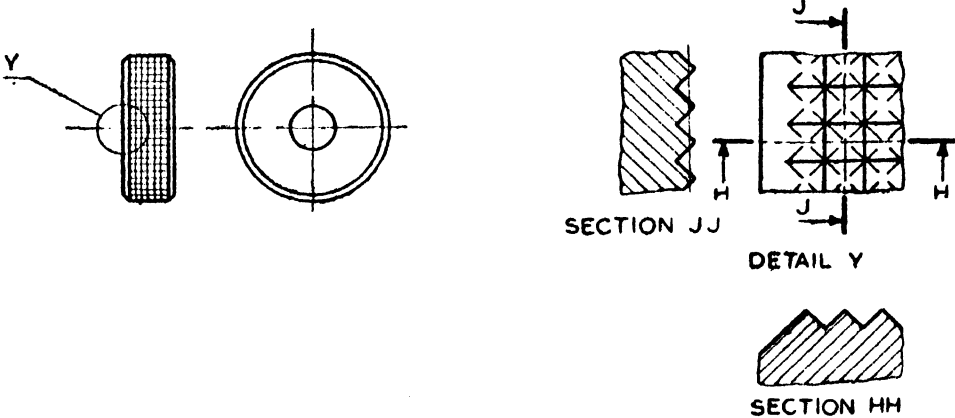
2. Types — Shall be of following types:

Type	Designation and Figure
AA	Knurling wheel with grooves parallel to axis SECTION AA DETAIL T
BL	Left-hand knurling wheel SECTION BB DETAIL U
BR	Right-hand knurling wheel SECTION CC DETAIL V

Type	Designation and Figure
GE	Left-hand/Right-hand knurling wheel, points raised W 30° 30° E D D DETAIL W SECTION EE SECTION DD
GV	Left-hand/Right-hand knurling wheel, points indented X 30° 30° G F G F DETAIL X SECTION GG SECTION FF
KE	Cross knurling wheel, points raised Y J H H J SECTION JJ DETAIL Y SECTION HH

AMENDMENT NO. 1 DECEMBER 1988
TO
IS : 6776 - 1980 SPECIFICATION FOR KNURLING WHEELS

(First Revision)

(*Page* 1, *clause* 1) — Substitute the following for the existing clause:

"**1. Scope** — Covers the dimensions and other requirements of knurling wheels with milled profile and ground profile, suitable for producing knurling according to IS : 3403-1981 'Dimensions for knurls (*first revision*)'."

(*Page* 5, *Explanatory Note, first para*) — Substitute the following for the existing para:

'This standard was first published in 1973 based on the dimensions of knurling to be produced, as given in IS : 3403-1966. Keeping in view the changes in the revision of IS : 3403, this standard was revised.'

(*Page* 5, *Explanatory Note, second para, fifth line*) — Substitute '*see* IS : 3403-1981' *for* '*see* Appendix A'.

(*Pages* 6 *to* 8, *Appendix* A) — Delete.

(EDC 45)

Type	Designation and Figure
KV	Cross knurling wheel, points indented SECTION K K DETAIL Z SECTION L L

3. Dimensions — As given in Table 1.

4. Tolerances

4.1 The concentricity limit for outer diameter with respect to the bore diameter shall be 0·1 mm.

4.2 The side face of knurling wheel shall be perpendicular to bore within the maximum limit of 0·03 mm.

4.3 The crest and root radii shall be as given below:

For pitches P up to and including 1·0 mm = 0·1 mm

For pitches P above 1·0 mm   = 0·15 mm

5. Material — High speed steel.

Note — Unless otherwise specified, the high speed steel shall be of designation T83W6Mo5Cr4V2 or T72 W18Cr4V1 according to IS : 7291-1974 'High speed tool steels' or equivalent, in which case the major constituents shall be specified by the manufacturer.

6. Hardness — 700 HV to 900 HV.

7. General Requirements

7.1 The profiles shall be:

     a) milled profile, and

     b) ground profile (gs)

7.2 The knurling wheels shall be made with the following executions:

     F = Chamfer on both sides

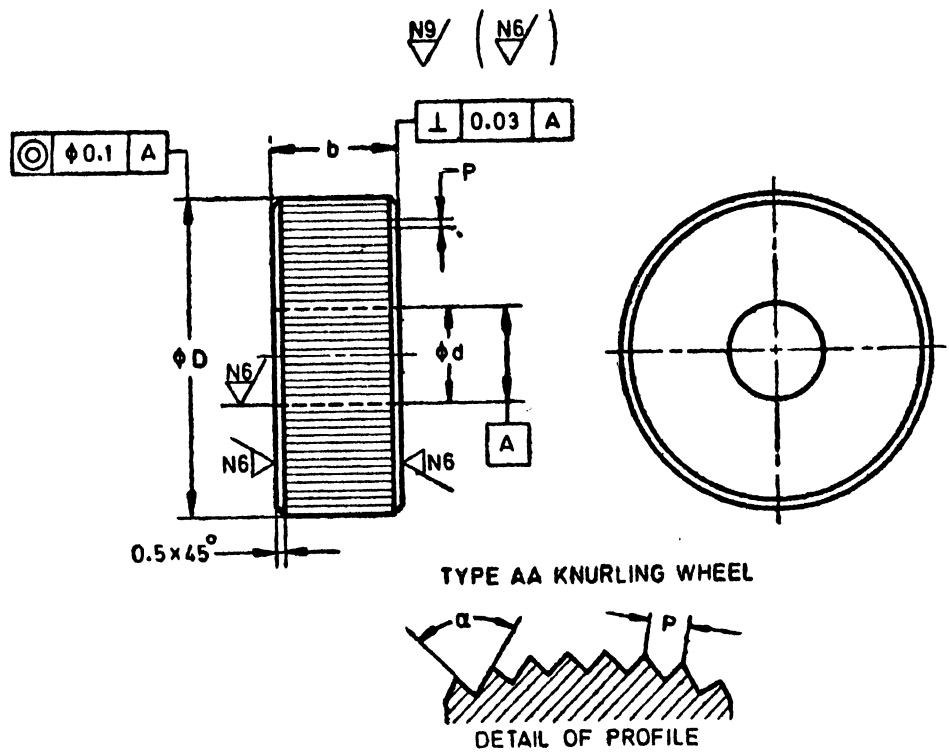 E = Chamfer on one side

     S = Without chamfer

8. Designation

8.1 A knurling wheel of Type BL having diameter D = 15 mm (15), Width b = 6 mm (06), chamfered on both sides (F), pitch P = 0·8 mm (08) with milled profile and conforming to this standard shall be designated as:

Knurling Wheel BL 1506 F 08 IS : 6776

TABLE 1 DIMENSIONS FOR KNURLING WHEELS

(Clause 3)

TYPE AA KNURLING WHEEL

DETAIL OF PROFILE

All dimensions in millimetres.

D ≈	b h9	P	d G7	Number of Teeth for Type		α	D ≈	b h9	P	d G7	Number of Teeth for Type		α
				AA, KE KV	BL, BR GE, GV						AA, KE KV	BL, BR GE, GV	
15	4	0·5	4	94	82		20	6	0·5	6	126	109	
15	5	0·5	4	94	82		20	8	0·5	6	126	109	
15	6	0·5	4	94	82		20	10	0·5	6	126	109	
15	4	0·6	4	78	68		20	6	0·6	6	105	91	
15	5	0·6	4	78	68		20	8	0·6	6	105	91	
15	6	0·6	4	78	68		20	10	0·6	6	105	91	
15	4	0·8	4	59	51	90°	20	6	0·8	6	79	68	90°
15	5	0·8	4	59	51		20	8	0·8	6	79	68	
15	6	0·8	4	59	51		20	10	0·8	6	79	68	
15	4	1·0	4	48	41		20	6	1·0	6	63	54	
15	5	1·0	4	48	41		20	8	1·0	6	63	54	
15	6	1·0	4	48	41		20	10	1·0	6	63	54	
15	4	1·2	4	39	34		20	6	1·2	6	52	45	
15	4	1·2	4	39	34		20	8	1·2	6	52	45	
15	4	1·2	4	39	34		20	10	1·2	6	52	45	
15	4	1·6	4	29	25		20	6	1·6	6	39	34	
15	5	1·6	4	29	25		20	8	1·6	6	39	34	
15	6	1·6	4	29	25		20	10	1·6	6	39	34	

8.2 A knurling wheel of Type BL having diameter D = 15 mm (15), Width b = 6 mm (06), chamfered on both sides (F), pitch P = 0·8 mm (08) with ground profile (gs) and conforming to this standard shall be designated as:

Knurling Wheel BL 1506 F 08 gs IS : 6776.

9. Workmanship and Finish — The knurling wheel shall be free from cracks, seams and burrs.

10. Marking — A knurling wheel shall be marked with the letter symbols for the following:

   a) Type;

   b) Diameter;

   c) Width;

   d) Pitch;

   e) Execution;

   f) Ground profile, if applicable; and

   g) Manufacturer's name or trade-mark.

Example:

A knurling wheel of Type BL having diameter D = 15 mm (15), width b = 6 mm (06), pitch P = 0·8 mm (08), chamfered on both sides (F) and with ground profile (gs) shall be marked as:

BL 1506 F 08 gs IS : 6776

10.1 *ISI Certification Marking* — Details available with the Indian Standards Institution.

<center>E X P L A N A T O R Y   N O T E</center>

This standard was first published in 1973. This revision has been necessitated so as to include various types of knurling wheels. Earlier the knurling produced was conforming to IS : 3403-1966 'Dimensions for knurling'. As this standard also needs revision, therefore, the dimensions for knurling have been specified in Appendix A to this standard. This appendix will be deleted as and when the revision of IS : 3403-1966 is published.

The previous terms straight, cross and diamond knurling wheels have been deleted and have been specified as left hand, right hand, left hand/right hand knurling wheels. The letter symbols assigned for various types of knurling wheels are for better differentiation and also easy to be used as a code designation for electronic data processing. The first letter (R) differentiates the knurling (*see* Appendix A) from the knurling wheels, the second letter (A, B, G and K) designates the basic type, while the third letter (A for parallel axis, L for left hand, R for right hand, E for raised and V for indented) indicates the direction and form of the grooves.

The helix angle of types BR, BL, GE and GV is fixed at a standard value of 30°. The profile angle normally used is specified as 90°.

In this standard formulae for calculating the initial diameter of the work piece as a function of the type of knurling and of the outside diameter of the finished knurling which is specified as nominal diameter have also been specified. The results obtained are only reference values, since the specific properties of the materials have not been taken in account. To facilitate the selection of knurling wheels, the manufacturing methods suitable for each type of knurling have also been specified in the appendix.

In the preparation of this standard considerable assistance has been derived from the following standards:

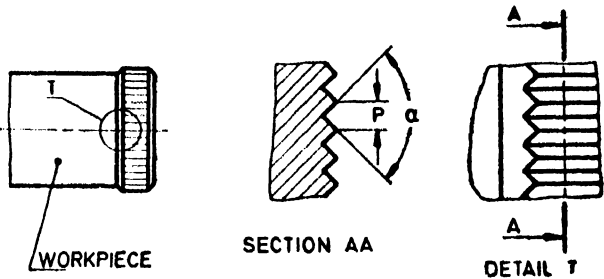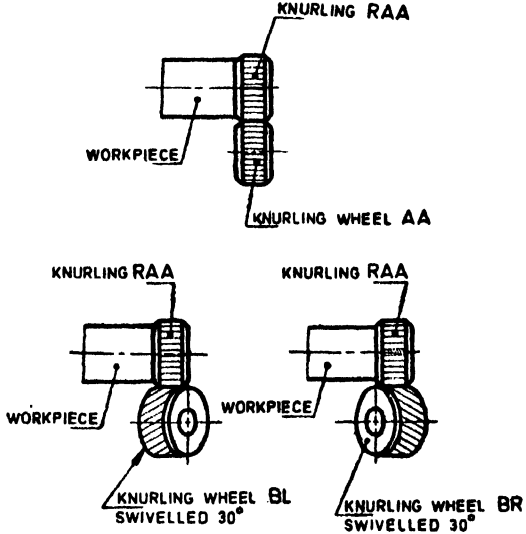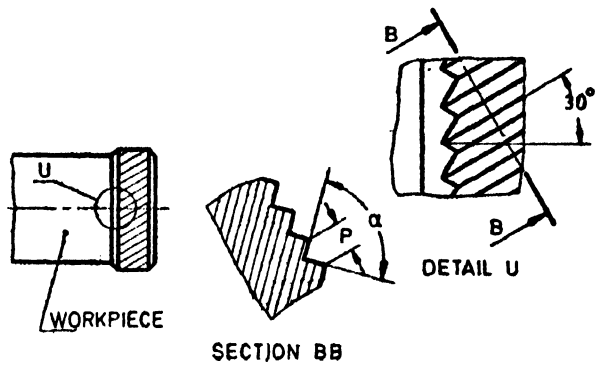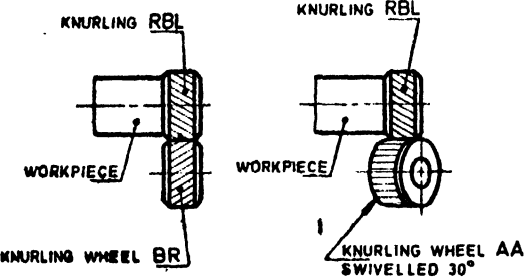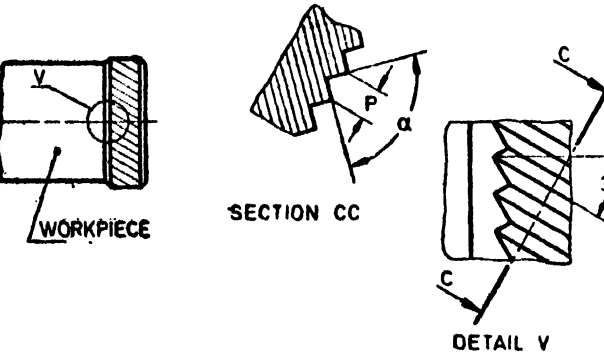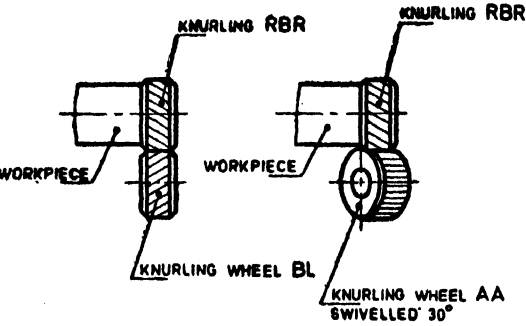DIN 82-1973 'Randel' (Knurls). Deutsches Institut für Normung.

DIN 403-1973 'Randelrader' (Knurling wheels). Deutsches Institut für Normung.

APPENDIX A
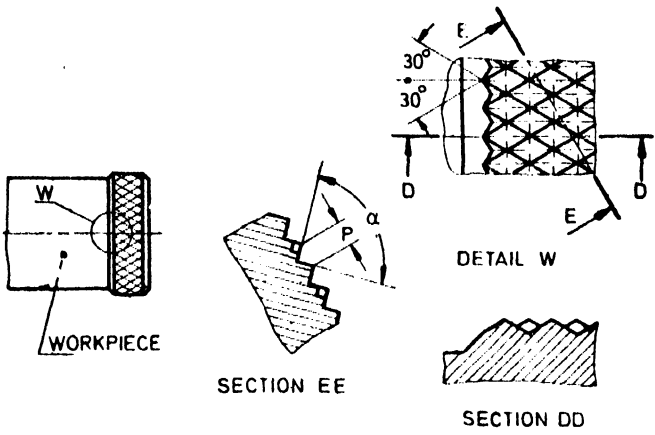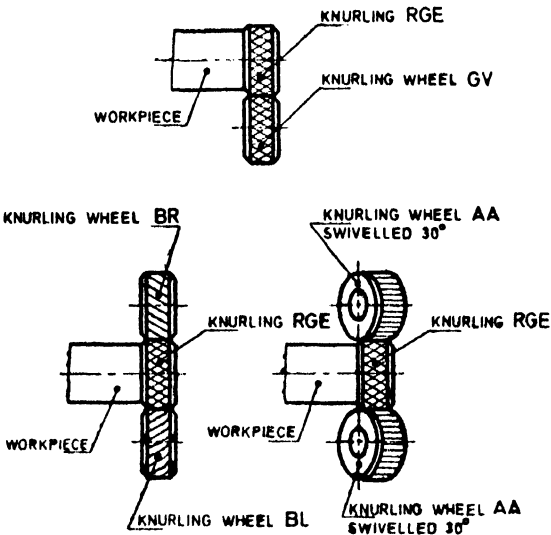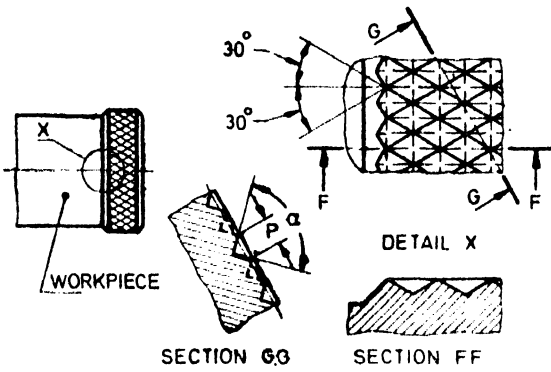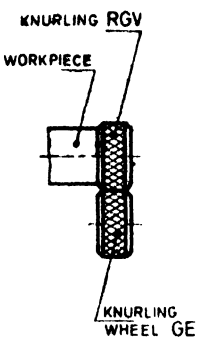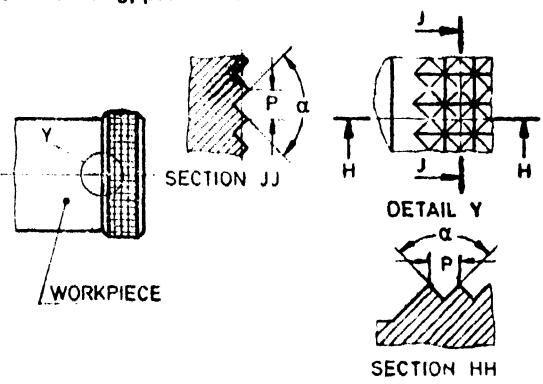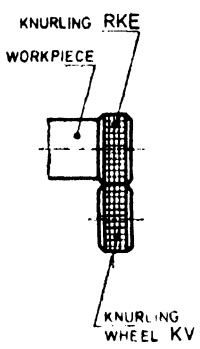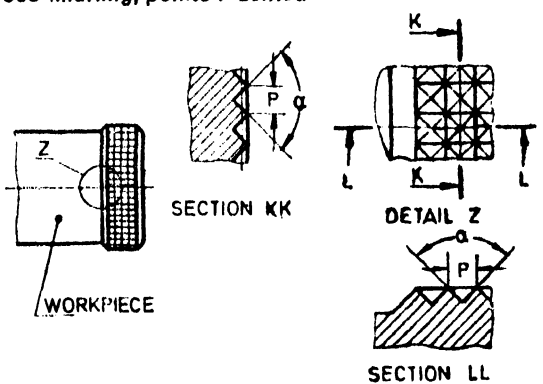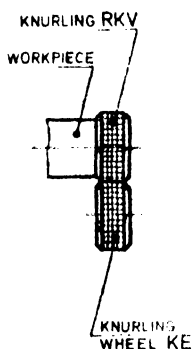
(Clause 1)

DIMENSIONS OF KNURLING

A-1. Knurlings shall be of the following types:

Type	Designation and Figure	Manufacturing Methods using Knurling Wheels According to IS : 6776
RAA	Knurling with grooves parallel to axis	
RBL	Left-hand knurling	
RBR	Right-hand knurling	

Type	Designation and Figure	Manufacturing Methods using Knurling Wheels According to IS : 6776
RGE	Left-hand/Right-hand knurling, points raised 30° 30° DETAIL W W WORKPIECE P α SECTION EE SECTION DD	KNURLING RGE KNURLING WHEEL GV WORKPIECE KNURLING WHEEL BR KNURLING WHEEL AA SWIVELLED 30° KNURLING RGE KNURLING RGE WORKPIECE WORKPIECE KNURLING WHEEL BL KNURLING WHEEL AA SWIVELLED 30°
RGV	Left-hand/Right-hand knurling, points indented 30° 30° G X WORKPIECE P α DETAIL X F G F SECTION GG SECTION FF	KNURLING RGV WORKPIECE KNURLING WHEEL GE
RKE	Cross-knurling, points raised P α Y SECTION JJ J H J H DETAIL Y α P WORKPIECE SECTION HH	KNURLING RKE WORKPIECE KNURLING WHEEL KV
RKV	Cross-knurling, points indented P α Z SECTION KK K L K L DETAIL Z α P WORKPIECE SECTION LL	KNURLING RKV WORKPIECE KNURLING WHEEL KE

7

A-2. Dimensions

(Figs. same as under A-1)

A-2.1 *Profile Angle*

Profile angle, $\alpha = 90°$

A-2.2 *Pitch* — Shall be the following:

Pitch P = 0·5, 0·6, 0·8, 1·0, 1·2, 1·6 mm

A-2.3 *Nominal Diameter, d_1* — The nominal diameter d_1 stated in the drawing is the outside diameter of the finished knurling; this dimension is a function of the design.

A-2.4 *Initial Diameter, d_2* — The initial diameter, d_2 of the workpiece prior to knurling must be smaller than the nominal diameter d_1, because the initial diameter undergoes enlargement through displacement of the material during the knurling operation.

The initial diameter, d_2 for knurlings with profile angle, $\alpha = 90°$ can be calculated from the formulae in the Table given below, depending on the type of knurl and the size of pitch.

The factors in the formulae, however, do not take into account the rounding of the grooves resulting from the knurling operation or the specific properties of the materials to be knurled.

Type of Knurling	Initial Diameter, d_2
RAA Knurling with grooves parallel to axis RBL Left-hand knurling RBR Right-hand knurling	$d_1 - 0·5\,t$
RGE Left-hand/Right-hand knurling, points raised	$d_1 - 0·67\,t$
RGV Left-hand/Right-hand knurling, points indented	$d_1 - 0·33\,t$
RKE Cross-knurling, points raised	$d_1 - 0·67\,t$
RKV Cross-knurling, points indented	$d_1 - 0·33\,t$